

Weather Intelligent Navigation Data and Models for Aviation Planning (WINDMAP)

Active Technology Project (2020 - 2024)

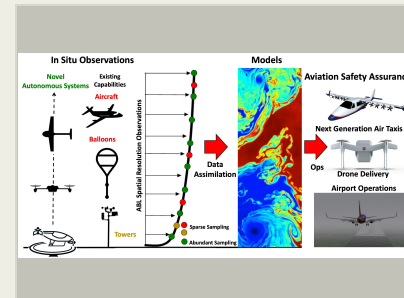


Project Introduction

WINDMAP addresses the emerging needs in the aviation community of providing real-time weather forecasting to improve the safety of low altitude aircraft operations. This is accomplished through the integration of real-time observations from autonomous systems, such as drones and urban air taxis, with numerical weather prediction models and flight management and safety systems. To solve this problem, several technical challenges have been identified. These include (1) developing autonomous UAS capable of conducting observations accurately and reliably; (2) determining the number and frequency of required observations and the sensitivity of these observations in data sparse regions of the lower atmosphere; (3) assimilating dense observational data into models in real-time with sufficient resolution and accuracy; (4) developing novel physics-based reduced order models capable of incorporating diverse data sets; and (5) integrating real-time forecasting into UTM and DAA (detect-and-avoid) architectures for path planning and navigation. The goal of this proposed effort is to demonstrate the value of using small UAS to collect measurements of the dynamic and thermodynamic properties of the lower atmosphere at scales that match or exceed the spatio-temporal resolution of today's best numerical weather prediction models.

Anticipated Benefits

The direct assimilation of data from autonomous platforms into weather models represents a paradigm shift in the way aviation weather hazards will be detected and predicted in the future. By providing real-time predictive capabilities for real-world dynamic weather environments capable of generating fine scale information for system-wide assurance focused on advanced aerial mobile trajectory planning, this effort will provide manned- and unmanned aircraft improved situational awareness to enhance safety and efficiency, particularly for unmanned traffic management, urban air mobility, and airport operations.



WINDMAP will develop technology to assimilate novel high resolution observations from autonomous advanced aerial mobility systems such as drones and urban air taxis into new hybrid models that will revolutionize aviation...

Table of Contents

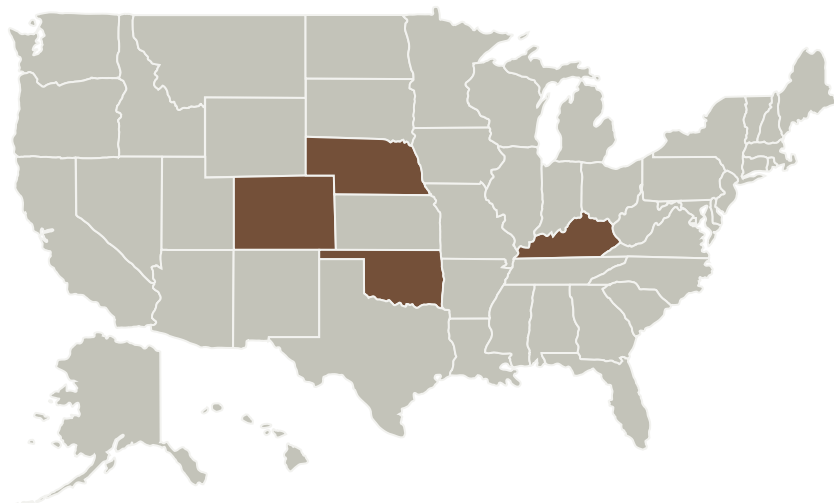
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destination	3
Supported Mission Type	3
Images	4
Project Website:	4

Weather Intelligent Navigation Data and Models for Aviation Planning (WINDMAP)

Active Technology Project (2020 - 2024)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Oklahoma State University	Lead Organization	Academia	Stillwater, Oklahoma

Organizational Responsibility

Responsible Mission Directorate:

Aeronautics Research Mission Directorate (ARMD)

Lead Organization:

Oklahoma State University

Responsible Program:

Transformative Aeronautics Concepts Program

Project Management

Program Director:

John A Cavolowsky

Project Manager:

Koushik Datta

Principal Investigator:

Jamey Jacob

Co-Investigators:

Brian R Elbing
Imraan Faruque
Nicoletta Fala
Phil Chilson
Keith Brewster
Suzanne W Smith
Sean C Bailey
Adam Houston
Carrick Detweiler
Craig Woolsey
James Pinto
Anders Jensen
Ryan Sobash

Weather Intelligent Navigation Data and Models for Aviation Planning (WINDMAP)

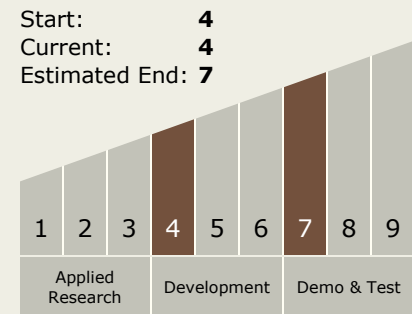
Active Technology Project (2020 - 2024)



Co-Funding Partners	Type	Location
Choctaw Nation of Oklahoma	Industry	Durant, Oklahoma
National Center for Atmospheric Research(NCAR)	Industry	Boulder, Colorado
University of Kentucky	Academia	Lexington, Kentucky
University of Nebraska	Academia	Lincoln, Nebraska
University of Oklahoma	Academia	Norman, Oklahoma
Vigilant Aerospace Systems	Industry	Oklahoma City, Oklahoma
Virginia Polytechnic Institute and State University(VA Tech)	Academia	Blacksburg, Virginia

Primary U.S. Work Locations	
Colorado	Kentucky
Nebraska	Oklahoma

Technology Maturity (TRL)



Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
 - TX16.2 Weather/Environment

Target Destination

Foundational Knowledge

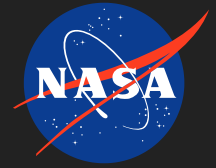
Supported Mission

Type

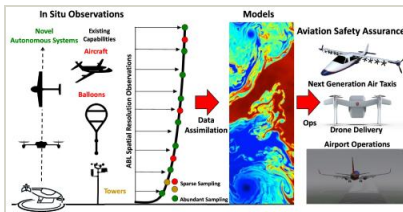
Push

Weather Intelligent Navigation Data and Models for Aviation Planning (WINDMAP)

Active Technology Project (2020 - 2024)



Images



WINDMAP technology

WINDMAP will develop technology to assimilate novel high resolution observations from autonomous advanced aerial mobility systems such as drones and urban air taxis into new hybrid models that will revolutionize aviation forecasting and improve aircraft operability and safety.

(<https://techport.nasa.gov/image/40836>)

Project Website:

<http://www.windmap.us/>